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Making heatsink calculations has always been a bit of a nuisance. This sample spreadsheet makes life easier. Its main advantage is that you can see at a glance which heatsink you need and how hot it will become.

First you have to enter a certain amount of data. Reasonable default values are already present, so you can simply keep what is already present for anything that you don't know.

Let's have a look at the various fields. You start with the power that the transistor must handle, in watts. You can calculate this by multiplying the voltage across the transistor by the current through the transistor. Next comes the thermal resistance. This differs for each type of transistor and package, so you will have to look it up on the manufacturer's data sheet under R_{thjc} (junction to case). A 7805 in a TO220 package, for example, has a value of 4, while a 2N3055 in a TO3 package has a value of 1.5. A modern component, such as the Siemens BUZ100 in a TO220 package, has the unbelievably low value of only 0.6! After this, you need to know the thermal resistance value for the insulator (if one is used). If no insulator is used, enter a zero. A few typical values are: flexible plastic: 0.4; aluminium oxide (hard, white, 1 to 2 mm thick): 0.3; mica: 0.4. In addition, it makes a difference whether or not heat-conducting paste is used. Here you can only select between yes (1) and no (0). The spreadsheet will then automatically fill in either 0.1 or 0.5, respectively.

Next, enter the desired maximum temperature. For example, the internal temperature of the transistor may not be allowed to be higher than 125, 150 or 175 degrees. You can find this value on the data sheet of the component in question (maximum junction temperature). If you don't know the value, 150

Heatsinks	
Input	
Power to be dissipated (watts)	30
Thermal resistance of transistor (degrees per watt)	1.5
Thermal resistance of washer (degrees per watt)	0.5
Heat conducting paste (1=yes, 0=no)	1
Max. heatsink temperature (degrees)	60
Max. temperature inside transistor	150
Result	
Heatsink (degrees per watt)	1.2
Transistor temperature (degrees celcius)	123
Heatsink temperature (degrees celcius)	60
Suggested heatsink type (F-shaped)	SK95 75 SK42 100

degrees is usually the maximum allowed value (175 is only for the most recent components), and 125 is a safer value that is always acceptable.

However, you may want to avoid having the heatsink become too hot. According to safety regulations, any heatsink that is exposed to touch must not be hotter than 60 degrees. A heatsink that becomes hotter than this must be protected against being touched. If you don't care about this, you can enter a higher value here.

The program now displays a result consisting of four values. The first is the required heatsink specification in degrees per watt. This represents the larger of the two heatsinks required

to maintain the maximum transistor temperature and to remain below the maximum heatsink temperature. In addition, you will see the internal temperature of the transistor, the temperature of the heatsink and a suggestion for a suitable heatsink (type and length), such as 'SK85, 75 mm'. Several different suggestions may be displayed in a row, as in the illustration. This is only a very limited suggestion, but it does give you a quick impression. Furthermore, you are always dependent on what your dealer has in stock, and he can work with the calculated value of degrees per watt. You will see that it's fun to play around with various input values, and this will give

you insight into the relationship between the heatsink and the temperature of the transistor.

The spreadsheet is available from the Download section of the *Elektor Electronics* website at

<http://www.elektor-electronics.co.uk>

If you want to modify the program, you will first have to disable the protection and make the invisible columns visible. We (and other readers) would enjoy hearing about any improvements you make.